

REMARKS

The above amendments to the above-captioned application along with the following remarks are being submitted as a full and complete response to the Office Action dated June 20, 2006 (U.S. Patent Office Paper No. 0606). In view of the above amendments and the following remarks, the Examiner is respectfully requested to give due reconsideration to this application, to indicate the allowability of the claims, and to pass this case to issue.

Status of the Claims

As outlined above, claims 2-3 stand for consideration in this application, wherein claim 3 is being amended to correct formal errors and to more particularly point out and distinctly claim the subject invention.

All amendments to the application are fully supported therein. Applicant hereby submits that no new matter is being introduced into the application through the submission of this response.

Formal Objections

The specification was objected to as failing to provide proper antecedent basis for the claimed subject matter on the ground that the specification lacks explicit basis for the phrase “the materials for surface modification is converted by the dissolution”, which was added to claim 3. Applicants respectfully disagree.

37 CFR 1.75 (d)(1) sets forth that the claim or claims must conform to the invention as set forth in the remainder of the specification and the terms and phrases used in the claims must find clear support or antecedent basis in the description so that the meaning of the terms in the claims may be ascertainable by reference to the description. As well, MPEP §608.01 (o) sets forth that the meaning of every term used in any of the claims should be apparent from the description portion of the specification with clear disclosure as to its import. However, neither 37 CFR 1.75 (d)(1) nor MPEP §608.01 (o) requires the claim be recited in the exactly the same language used in the remainder of the specification.

The phrase “the materials for surface modification is converted by the dissolution” added to claim 3 is clearly supported by the original recitation of claim 3 “dissolution caused thereby is utilized to peel the surface of the semiconductor nanoparticles, thereby converting the materials for surface modification.” Because the amended recitation at issue corresponds

to the context of the description above mentioned, that recitation would meet the requirements of 37 CFR §1.75 (d)(1) and MPEP §608.01 (o).

In order to advance the prosecution of this case, claim 3 is being amended as originally submitted, as set forth above. Accordingly, withdrawal of this objection is respectfully requested.

Formal Rejections

Claim 3 was rejected under 35 U.S.C. §112, first paragraph, as failing to comply with the enablement requirement. Claim 3 was also rejected under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

As set forth above, claim 3 is being amended as outlined above. Accordingly, withdrawal of these rejections is respectfully requested.

Prior Art Rejections

The First 35 U.S.C. §102(b) rejection

Claims 2-3 were rejected under 35 U.S.C. §102(b) as being anticipated by Gerion et al (*J.Phys. Chem. B* 2001). Applicant respectfully traverses the rejection of claim 2-3 for the reasons set forth below.

According to the M.P.E.P. §2131, a claim is anticipated under 35 U.S.C. §102 (a), (b), and (e) only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference.

Claim 2

Claim 2 recites that a method for purifying semiconductor nanoparticles comprises the steps of: modifying semiconductor nanoparticles with oil-soluble materials for surface modification; converting the oil-soluble materials for surface modification into water-soluble materials for surface modification at the interface between an organic solvent and water; shifting the semiconductor nanoparticles from an organic phase to an aqueous phase by the conversion; and then subjecting the semiconductor nanoparticles, the surfaces of which have been modified with the water-soluble materials for surface modification, to size-selective photoetching, wherein the surface of the semiconductor nanoparticles is dissolved and peeled by the size-selective photoetching, and particle sizes of the semiconductor

nanoparticles are regulated and the semiconductor nanoparticles are monodispersed by the dissolution.

Claim 2 is directed a method of size-selective photoetching. Torimoto et al. (*J. Electrochem. Soc.* Vol. 145, No. 6, pp 1964-1968, June 1998) describes the features of size-selective photoetching or photocorrosion of CdS nanoparticles. The principle of the size-selective photocorrosion or photoetching relies on the fact metal chalcogenide semiconductor particles are photodegraded in aqueous solution with bandgap excitation. (Page 1964, left column, lines 20-23 of Torimoto) The reaction scheme of photocorrosion of CdS particles is described in the chemical formula [1] on page 1965 of Torimoto.

In contrast, Gerion is directed to a method of photobrightening nanoparticles. Photoetching and photobrightening are completely different. Gerion merely shows in Fig. 1 that CdSe/ZnS core/shell nanoparticles are modified to MPA-coated nanocrystals. Silanized nanocrystals exhibit enhanced photochemical stability over organic fluorophores and high stability in buffers at physiological conditions. (Abstract) Gerion further states that the passivation shell imparts an efficient photochemical stability so that the photo-bleaching is reduced (page 8861, left column, lines 8-6 from the bottom). Thus, it is hardly expected that the MPA-coated nanocrystals of Gerion could be photodegraded or photo etched. In other words, the method recited in claim 1 and the method shown in Gerion are completely different.

Therefore, Gerion cannot and does not show every element recited in claim 2. Accordingly, claim 2 is not anticipated by Gerion.

Claim 3

Claim 3 has the substantially same features as those of claim 2, with respect to photoetching nanoparticles. As such, the arguments set forth above are equally applicable here. Claim 2 being allowable, claim 3 must also be allowable.

35 U.S.C. §103(a) rejection

Claims 2-3 were rejected under 35 U.S.C. §103(a) as being allegedly unpatentable over Gerion in view of Torimoto et al (*J. Phys. Chem. B* 2001). This rejection is respectfully traversed for the reasons set forth below.

According to the Manual of Patent Examining Procedure (M.P.E.P. §2143),

To establish a prima facie case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both not be found in the prior art, not in the applicant's disclosure.

Furthermore, referring to *In re Fulton*, M.P.E.P. §2143. 01 (I) sets forth as follows:

The court emphasized that the proper inquiry is "whether there is something in the prior art as a whole to suggest the desirability, and thus obviousness, of course, of making the combination," not whether there is something in the prior art as a whole to suggest that the combination is the most desirable combination available.

Furthermore, referring to *In re Mills*, M.P.E.P. §2143. 01 (III) sets forth as follows:

The mere fact that reference can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination.

The Examiner alleged that Gerion does not recognize that the irradiating of the aerated solution causes size-selective etching. However, Torimoto teaches that size-selective photoetching is a useful technique for forming ultrasmall semiconductor nanoparticles. The Examiner further alleged that it would have been obvious to one of ordinary skill in the art to use size selective photoetching, thereby regulating particle size, monodispersing them, peeling and converting the materials for surface modification, in the method of Gerion on the ground of Torimoto's teaching that it is a useful technique for forming small semiconductor nanoparticles. Applicants respectfully disagree.

Torimoto states that the principle of the size-selective photoetching relies on both facts that metal chalcogenide semiconductor particles are photocorroded in an aqueous solution under irradiation. However, as set forth above, Gerion's photobrightening does not aim to do photoetching evidences that Gerion does not explicitly or implicitly suggest the desirability to combine with a step of photoetching nanoparticles.

In sum, there is no suggestion or motivation in either Gerion or Torimoto to combine these features explicitly or implicitly, or in the knowledge generally available to one of ordinary skill in the art at the time the invention was made to embody all the features of the

invention as recited in claims 2-3. Accordingly, claims 2-3 are not obvious in view of all the prior art cited.

Obviousness Double Patenting Rejection

Claims 2-3 were rejected pursuant to the judicially-created doctrine of obviousness-type double patenting as being unpatentable over claims 1-9 of Sato et al. (U. S. Pat. No. 6,911,082) on the grounds that transporting “between” an aqueous layer and an organic layer encompasses shifting to an aqueous phase. In response to Applicant’s arguments filed May 31, 2006, the Examiner alleged that Sato ‘082 has surface modifying materials, and a step of photo-corrosion, which is the same as in the present invention, and cites transporting to an aqueous layer, size-selective photo-corrosion, thiol compounds, and TOPO/TOP in claims 1, 2, 4, and 5, respectively. Applicants respectfully disagree.

Claims 2-3 of the present application do not require such a step of coating semiconductor nanoparticles with ZnS. In contrast, Sato ‘082 is directed to a method of manufacturing a multi-layer semiconductor nanoparticles. Claim 1 of Sato ‘082 recites not only the step of transforming the nature of a solution of monodisperse semiconductor nanoparticles stabilized by a surface stabilizer between hydrophilic and lipophilic solution by substituting the surface stabilizer, but also the step of coating the semiconductor nanoparticles in the layer to which the semiconductor nanoparticles have been transported with multiple layers. Sato ‘082 shows, referring to Fig. 1, that the semiconductor nanoparticles are coated with ZnS. The method of Sato ‘082 requires the step of coating semiconductor nanoparticles with ZnS in order to eliminate the energy band that existed in the forbidden band. There is no desirability of deleting this step in Sato’082. Consequently, Claims 2-3 would not be obvious over Sato ‘082.

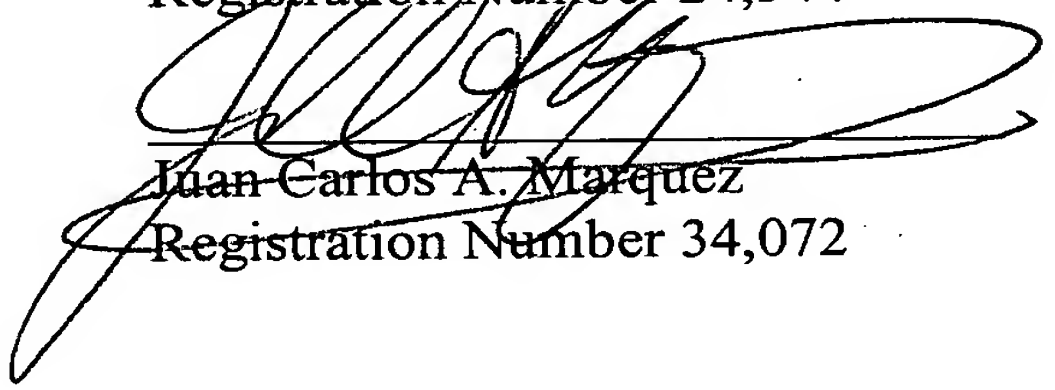
Conclusion

In view of all the above, Applicant respectfully submits that certain clear and distinct differences as discussed exist between the present invention as now claimed and the prior art references upon which the rejections in the Office Action rely. These differences are more than sufficient that the present invention as now claimed would not have been anticipated nor rendered obvious given the prior art. Rather, the present invention as a whole is distinguishable, and thereby allowable over the prior art.

Favorable reconsideration of this application as amended is respectfully solicited. Should there be any outstanding issues requiring discussion that would further the prosecution and allowance of the above-captioned application, the Examiner is invited to contact the Applicant's undersigned representative at the address and phone number indicated below.

Respectfully submitted,

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